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MY EXPERIMENTS WITH HELICOPTERS.

By Etienne Oemichen.

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MY EXPERIENCE WITH HELICOPTERS.*

By Etienne Oemichen.

I am pleased with my experiments, though I am but at the beginning of my research. Much remains to be done and I hope for success, though I know that there are many difficulties to be overcome. When I think of the difficulties already surmounted, I take courage.

In order to give a clear idea of the beginning of my work, I must mention the tests I made with my helicopter No. 1. I balanced it with a ballonet of 144 cubic meters, developing a total lift of 70 kilos for a machine of 340 kilos. With my device, I was able to make nearly 80 flights. In no way could it pretend to the title of "aircraft." The engine was a ten year old model, the power transmission was elementary and precarious, and the whole formed simply an experimental device, in no way suitable for sporting performances, but simply for experimental purposes.

The real research work began with my helicopter No. 2, which, though more complete and nearer to a practical solution of the problem, is still very imperfect, in view of all the requirements. From November 6, 1922, to January 15, 1923 (the second anniversary of my first attempt on my first helicopter), I succeeded in

* From "L'Air," January 20, 1923, pp. 9-10.

making about thirty flights with the new one and was able to remain stationary at a fixed point for 2 min. 37 sec., at heights of from 1 to 3 meters. I was also able to make horizontal flights, limited only by the size of the field to about 80 meters. These experiments, however, are to be continued on a larger field. This helicopter was designed for certain definite purposes decided upon in agreement with the Service Technique de l'Aeronautique, for which I am now working with the support of Messrs. Peugeot.

The objects to be attained comprise the power to remain stationary for five minutes and to make a closed flight at a low altitude. In order that our whole attention could be given to these two points, we purposely put aside the question of descent with engine shut off. This question will be investigated later on another helicopter which has already been designed. A certain degree of safety has, however, been assured by the use of the gyroscope. In case of engine failure, the gyroscope comes into play, insuring safe descent from an appreciable height which can be calculated. This height is about that at which the required performances must be carried out.

I hope soon to be able to work at the problem of horizontal flight. I have already made short flights in a straight line without any difficulty. My helicopter has considerable reserve lifting power and can carry three men, 30 liters of gasoline and all equipment required for a 45 min. flight. I am now adjusting more accurately the pitch of the propellers in order to obtain better stability. As a matter of fact, there is an overweight on

the right which worries me. Up to now, I have used ballast for balancing, but I think it would be better to have the pitch of the left propeller 5/10 or 6/10 degree less than that of the right.

If the weather is favorable, I hope to make five or six flights within the next two weeks and to solve the problem of remaining stationary in the air for five minutes. On my No. 2 helicopter I have been in the air altogether over twenty minutes. I expect to make rapid progress when I have a larger field to work on.

Description of Oemichen-Peugeot Helicopter No. 2.

The framework is of duralumin tubing forming a large cross with arms of unequal length. The axis of the long arm, or longitudinal axis, represents the body and defines the main direction of motion. At the four points of the cross are placed the lift propellers and the traction propeller.

The central cage contains the engine and the stabilizing organs. The driving force is supplied by a 120 HP, 9 cylinder, Rhone engine, type J, modified to function with vertical axis. There are two gasoline tanks, together holding 60 liters. If the helicopter takes an inclined position the connection between the tanks is automatically closed.

The whole framework is supported by an undercarriage consisting of:

1st. Four footballs in cup-like holders of sheet duralumin placed under the four feet of the central cage;

2nd. Three-jointed skis ending in jointed shoes and suspend-

ed by shock absorbers of elastic cord (sandows).

3rd. A pair of balls placed forward on a fixed shoe.

The whole helicopter in working order, weighs 850 kg., including weight of pilot.

I - LIFT.- Lift is obtained by means of four propellers grouped in pairs, lateral and longitudinal, with respective diameters of 7.5 m. and 6.4 m. These four propellers revolve at the same rate. They are of the Oemichen "recuperation" type. The propellers are mounted on special cone hubs with ball bearings so arranged that the entire load can be carried by one blade only. The power is transmitted to the propeller by four tubular shafts placed in pairs at different levels and starting from a central case containing gear wheels.

II - STABILIZATION.- Stability is mainly assured by a gyroscope keyed to the engine shaft and revolving with a maximum rim speed 130 meters per second. This device suffices for stabilization, when there is no wind and reduces the oscillations when the atmosphere is disturbed.

Lateral and longitudinal stability is provided by a group of four variable pitch propellers placed one at each extremity of the framework. These are all controlled by the control stick in the pilot's cockpit. The pilot can increase or decrease the angle of attack of the blades of these propellers at will, thus increasing or decreasing the effects of traction of the principal propellers. This device thus enables him to create righting couples of variable intensity, either to right the helicopter when the gyro-

scope is insufficient to preserve equilibrium, or, on the contrary, to give the helicopter a certain angle of attack.

III - HORIZONTAL FLIGHT is obtained by a tractor propeller placed forward. This propeller is being constructed and is to replace the one now used, which has a fixed pitch. The new one will have adjustable pitch and by means of a pedal the incidence of the blades can be changed so that the pitch can be adjusted either positively or negatively. At zero angle of attack, the propeller has no effect. If the pitch is increased, it draws the helicopter forward; if decreased, the helicopter revolves in the opposite direction. This device is intended to control the traction or to act as a brake, as the pilot may deem necessary.

IV - DIRECTIONAL CONTROL.-

a) For horizontal flight, directional control is assured by a pair of rudders behind the tractor propeller and controlled at present by a pedal. Later, they are to be controlled by a lever placed on the control stick.

b) Lateral control is obtained by a pair of horizontal panels which deflect the movement of the forward propeller (diameter 6.4 meters). These panels are controlled in the same way as those for directional control.

When the control is by a hand lever, I shall be able to operate the directional control by merely giving a slight turn to the knob at the top of the control stick. In horizontal flight, steering is accomplished by means of the panel rudders behind the trac-

tor. If the helicopter is stationary, the vertical currents created by the forward propeller and deflected to the right or left by the panel rudders, cause the helicopter to turn either to the right or to the left.

V - ANTIROTARY STABILIZATION.- The antirotary couples produced by the action of the gyroscope and engine which, together, may be compared to a single propeller, is counterbalanced by a propeller with a horizontal axis and a long lever arm controlled by being geared to the shaft of the 6.4 m. forward propeller.

The helicopter as it now stands only marks a step towards the final solution which I shall endeavor to discover.

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